Debs's Redhead   Points to deal with.

1. ~~Bridgman's arguments against conventionalism.~~

2. acceleration v. G.R.

3. light-lines slope = 1

4. Reference to Holstein & Swift

5. References without page nos but inclusive page references

6. Reference to Kacser & discordant measures of distance.

7. ~~Problem of~~ Grünbaum's problem of non-standard synchrony.

8. Cylindrical space-time. More details.

9. l.c. for paper titles in references.

10. ~~Reference to Winnie to clock~~

11. ~~" " " , Bridgman~~

(1) The role of accelerated reference frames in explaining the twin's aging is also ~~criticized~~ critically examined (A)

(2) ✓ Scientia 10, 31-54 (1911)

(3) ✓ Delete ftnote 5.

(4) ✓ Delete footnotes 12, 13, 14 — Replace 12 in text by reference back to 4 on p. 3.

(5) ✓ Delete last clause of para 1. on p. 4.

(6) ✓ Insert 'a' on p. 4 para 3, line 1.

(7) ✓ p. 4, Comma after ftnote 15, [illegible]

(8) B Since we are dealing with flat spacetime, the reference to 'general relativity' in this context is decidedly misleading[16]
[footnote 16: ~~See in particular~~ For discussion of this point see in particular, Edward E.A. Desloge and R.J. Philpott, "Uniformly accelerated reference frames in special relativity", Am. J. Phys. 55, 252-261 (1987)]

(9) ✓ change ~~ref. 21~~ footnote 21 to Am. J. Phys. 57, 791-799 (1989).

(10) ✓ Delete footnote 22

(11) ✓ acceleration based

(12) umlaut on Groenlands

(13) ✓ delete "Reichenbach ad."

(14) ✓ check page refs for Winnie

(15) ✓ Delete · between square brackets on p. 7.

(16) ✓ Delete footnotes 27 – 29.

(17) check Winnie's Eq (5) on p. 7. pp. 81–99

(18) Insertion on conventionality thesis:

c The conventionality thesis and the concomitant issue of whether it is possible, in a nonarchaic fashion, to make a factual measurement of the one-way speed of light, has attracted considerable discussion in both the philosophical and physics literature.
For a spirited defence of the ~~defence~~ views reference ~~should~~ may be made to Salmon [21,22] and
d Erlichson [22,23], ~~and also the comprehensive review by Redhead~~[3].

[footnote 21/22: W. C. Salmon, "The philosophical significance of the one-way speed of light", Noûs 11, 253–292 (1977)

footnote 22/23: H. Erlichson, "The Conventionality of Synchronization", Am. J. Phys. 53, 53–55 (1985).]

objections to the conventionality thesis take three main forms. Firstly the loss of simplicity arising from the anisotropic effects associated with using non-standard synchrony. Thus Brehme writes[24] "It can be done, but it is so artificial as to jar our sense of fitness".

[Ref. [24] R.W. Brehme "Response to 'The conventionality of synchronization'," Am. J. Phys. 53, 56-59 (1985)

But the conventionality thesis is an issue, not about simplicity but about what is factual and what is conventional in the foundations of special relativity.

A more promising criticism is to introduce methods of establishing distant synchrony which do not depend on a prior choice of the ε-parameter. Much discussed in this connection is the method of slow clock transport as introduced by Bridgman[25]

[Footnote [25]. P.W. Bridgman, A Sophisticate's Primer of Relativity, (Wesleyan University Press, Middletown, Conn., 1962), pp. 64-67.

Introducing a notion of self-measured velocity $\bar{v}$ (i.e. what is now usually called proper velocity) Bridgman showed that in the limit as $\bar{v} \to 0$, slow clock-transport synchrony agrees with the Einstein convention, without presupposing it.

A similar line of argument has been developed by Brehme[~~25~~ 26].

[footnote ~~25~~ 26 R. W. Brehme "On the physical reality of the isotropic speed of light", Am. J. Phys. 56, 811-813 (1988)

who also uses clocks moving in opposite directions with the same proper speed to establish distant synchrony in agreement with the Einstein convention.

Recently, A more sophisticated line of argument[~~27~~ 26] can be traced ~~back~~ ~~by~~ to the work of Robb

(footnote ~~26~~ 27 A. A. Robb, *A Theory of Time and Space*, (Cambridge University Press, Cambridge, England, 1914)

Robb's work was 'rediscovered' in the 1960s. For a modern treatment see, for example, E. C. Zeeman, "Causality implies the Lorentz group," Journ. J. Math. Phys. 5, 490-493, (1964.)

The essential idea here is to note that ~~at the~~ standard Einstein synchrony is equivalent to Minkowski-orthogonality to the time axis of the reference frame, and then to ~~show~~ demonstrate that Minkowski-orthogonality is definable from the causal structure of Minkowski-space-time, i.e. the light-cone structure without any assumptions about the one-way speed of light.

Nevertheless the conventionality claims can

still be defended on the grounds that any methodology that establishes standard synchrony in a moving frame, will automatically define non-standard synchrony in a stationary frame, so the conventional element is restored in specifying simultaneity in the stationary frame, viz. the choice of whether to import into that frame the standard synchrony defined in any of the moving frames, ~~and the resulting~~ ~~[illegible]~~.

For the present we shall proceed on the assumption ~~of~~ that the conventionality thesis is correct, and refer the reader for a comprehensive review of this issue to ~~Redhead~~[3] Ref. 3. the work cited in n. 3.

(19) D By cylindrical space-time we mean a two-dimensional universe in the shape of an infinitely long cylinder, with time running "up" the cylinder and space running "around" it.

(20) E This scenario has also been examined by Redhead[3] who has shown how ~~the~~ parallelogram construction can be adapted to spell out the conventionality limits on synchronizing distant clocks in cylindrical space-time.

(21) ✓ will → ~~can~~ may

F (22) in the standard formulation of the twin paradox

(23) if the journeys of the twins are to start and finish in spatial coincidence. 4E G

at any rate

(24) It remains true of course that without acceleration then in Minkowski space-time it is impossible to have twice-intersecting trajectories so as to formulate the twin paradox with the twins starting and finishing in spatial coincidence. So in this sense, acceleration is an essential ingredient in understanding the twin paradox. It may be noted, however, that even this role for 'acceleration' can be eliminated in formulations of the twin paradox in curved space-time[38,39] — ~~factual~~[38,39] see for example the discussion in Barry. R. Holstein and Arthur R. Swift "The Relativity twins in free fall", Am. J. Phys. 40, 746–750 (1972).

Eg H